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Description

This invention relates to an electrical connector and to a commutator segment for an electric motor, having such a connector.

In our British Patent No. 2128818B, for example, we described a connection between an armature winding and a commutator segment which avoids the application of heat to effect the connection and which utilises the principle of insulation displacement in which a wire having an insulating cover is forced into a slot narrower than the wire diameter to form a clean metal to metal contact between the wire and a terminal portion of the commutator segment.

EP A 0 034000 discloses an electrical connector having two overlying parts, each part being provided with a slot open at one end. Although the two slots are arranged only partially in register they are arranged about a common central slot line. One part is of greater width than the other so that the slots each grip a wire separately in use. The effective width of the overall slot is not governed by the degree of non-registration or overlap of the two parts.

Often the wire has a diameter of less than 0.20mm with the result that the width of the slot has to be 0.15mm or less. Difficulties have been encountered in manufacturing commutator segments with such narrow slots on a consistent basis.

The present invention seeks to mitigate this drawback not only in commutator segments, but also in other types of electrical connector.

According to the invention there is provided an electric connector having two overlying parts, each part being provided with a slot open at one end and the two slots being arranged so as to be only partly in register with one another in which the resulting slot in the connector is narrower than each of the slots in the two overlying parts to receive and grip a wire at the open end, and the non-aligned regions bordering the slots of the two overlying parts are off-set, in a direction perpendicular to the plane of each overlying part, out of the plane of the respective part towards the other part.

Preferably, the two overlying parts are integrally connected at a fold line extending transversely of the longitudinal extent of the said resulting slot.

Advantageously, said non-aligned regions are half-sheared out of the plane of the respective part and the two overlying parts are in contact or closely adjacent to one another so that said regions lie in, or substantially in, a common plane.

Other preferred and/or optional features of the invention are set forth in claims 5, 6 and 7.

Conveniently, the connector forms a terminal portion of a commutator segment and serves to

connect an armature winding portion to the commutator segment. However, the connector could take other forms. For example, it could slidably connect with a terminal to connect a wire thereto.

The invention will now be more particularly described way of example with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of a commutator provided with commutator segments (only one shown) embodying the invention,

Figure 2 is an enlarged plan view of one embodiment of a commutator segment embodying the invention, in blank form,

Figure 3 is an enlarged plan view of part of the commutator segment of Figure 2 shown partly formed, and

Figure 4 is a section taken along line IV-IV of Figure 3 on an enlarged scale.

Referring first to Figure 1 of the drawing, there is shown therein a commutator base 10 and a commutator segment 11. The segment 11 has an electrical connector in the form of an integral terminal portion 12 at one end and an integral lug 13 at its other end with a brush contacting portion 9 therebetween. The base 10 has at one end an integral rose-like arrangement of five housings 14 each provided internally with a central boss (not shown) upstanding from the base of the housing.

In assembling this commutator, an armature winding portion is located in an aligned pair of slots 15 in each housing so as to be supported by the closed ends of the slots 15 and a respective boss. The commutator segments (only one shown) are then moved in a direction parallel to the axis of the base 10 so that the terminal portions 12 move into respective housings 14 and the lugs 13 move into respective recesses in the end of the base remote from the housings. Slots 16 in parallel arms 17 of the terminal portions 12 have cutting edges which strip insulation from the winding portions as the slots 16 move thereover and the slots then straddle and grip the core of the winding portions to establish and maintain electrical contact between the winding portions and respective terminal portions 12.

Each arm 17 comprises two overlying parts as more particularly shown in Figures 2, 3 and 4.

The terminal portion 12 of the commutator segment blank shown in Figure 2 is generally rectangular with its minor axis coincident with the longitudinal axis of the brush contacting portion 9 of the commutator segment. The terminal portion 12 comprises a central part 18 and two end parts 19 and 20. The central part 18 has a central cut out portion 8 which reduces from its largest width at the centre to two elongate slots 21 which terminate either end of the cut out. Each end part 19, 20 also has an

elongate slot 22 which, when the end part 19, 20 is folded about fold line 23, 24, respectively, to overlie the central part 18 (as shown in Figure 3), comes only partly into register with the respective slot 21 in the central part 18.

Thus, the resulting slot 16 (Figures 1 and 3) on each side of the terminal portion is narrower than each of the slots 21 and 22.

Non-aligned regions (as considered in a direction perpendicular to the plane of each overlying part) 31 and 32 bordering the slots 21 and 22, respectively, of the two overlying parts 18 and 19 and the two overlying parts 18 and 20 are offset out of the plane of the respective part towards the other of the two overlying parts. This is most clearly seen in Figures 3 and 4. The regions 31 and 32 interlock with non offset regions, as best shown in Figure 4, to prevent movement of the end parts 19 and 20 with respect to the central part 18.

The offset of the respective non-aligned regions is effected by a part-shearing operation and preferably the regions 31 and 32 are half sheared out of the plane of the respective part 18, 19, 20 so that when the overlying parts 18 and 19 and the overlying parts 18 and 20 are in contact or closely adjacent to one another as for example shown in Figure 4 the regions 31 and 32 of each arm 17 lie in a common plane to define the resulting slot 16.

Two cutters 26 and 27 having sharp cutting edges project into each slot 16, the cutter 26 being provided on the region 31 of the central part 18 and the cutter 27 being provided on the region 32 of the end part 19, 20. The cutting edges on the cutters 26 and 27 are for stripping insulation from the winding portions as previously described.

The closed end of the slot 16 is enlarged to ensure that the edges of the slot 16 have a certain resilience to separation by the winding.

A triangular barb 28 is provided on either side of the minor axis of the central part 18 along the edge furthest from the commutator segment. Barbs 29 on the end parts 19 and 20 register with barbs 28 when the end parts 19 and 20 are folded to overlie the central part 18 as shown in Figure 3 and these barbs 28 and 29 grip the housing 14 (Figure 1) and thereby retain the terminal portion 12 in the housing 14.

The brush contacting portion 9 of the commutator segment is of arcuate form to conform to the external radius of the commutator base 10. The terminal portion 12 is bent upright from the commutator segment 11 and the central part 18 of the terminal portion is bent at 90° in areas 30 to form the arms 17 (Figure 1) which extend parallel to each other and to the longitudinal axis of the commutator segment 11, and forward along the length thereof.

The above embodiment is given by way of example only and various modifications will be apparent to persons skilled in the art without departing from the scope of the invention defined by the appended claims.

For example, the terminal portion 12 may be designed with only one arm 17 or may have more than two arms 17. Instead of the barrel commutator shown, the commutator may be a face commutator with the commutator segments arranged in a single plane perpendicular to the axis of the armature. Furthermore, the winding portions may be pre-stripped of insulation thus avoiding the need to provide the cutters 26 and 27.

Also the electrical connector could take a form other than an integral terminal of a commutator segment. For example, the connector could be in the form of a device for connecting a wire to a terminal, the device being adapted to slidably connect with the terminal and having a slot formed in the manner described herein which straddles and grips a wire as the device is connected to the terminal.

Claims

1. An electrical connector having two overlying parts (18 and 19; 18 and 20), each part (18 and 19; 18 and 20) being provided with a slot (21, 22) open at one end and the two slots (21, 22) being arranged so as to be only partly in register with one another characterised in that the resulting slot (16) in the connector is narrower than each of the slots (21, 22) in the two overlying parts (18 and 19; 18 and 20) to receive and grip a wire at the open end, and in that non-aligned regions (31, 32) bordering the slots (21, 22) of the two overlying parts (18, 19; 18, 20) are off-set, in a direction perpendicular to the plane of each overlying part (18, 19, 20), out of the plane of the respective part (18, 19, 20) towards the other part (18, 19, 20).
2. A connector as claimed in claim 1, characterised in that said non-aligned regions (31, 32) are half sheared out of the plane of the respective part (18, 19, 20) and the two over lying parts (18, 19; 18, 20) are in contact or closely adjacent to one another so that said regions (31, 32) lie in or substantially in a common plane.
3. A connector as claimed in any one of the preceding claims, characterised in that the two over lying parts (18, 19; 18, 20) are integrally connected at a fold line (23, 24) extending transversely of the longitudinal extent of the said resulting slot (16).

4. A connector as claimed in any one of the preceding claims, characterised in that it includes a barb (28, 29) for retaining the connector in a housing (14).

5. A connector as claimed in any one of the preceding claims, characterised in that the resulting slot (16) in the terminal portion 12 has two cutting edges (26, 27) for cutting through insulation of an insulated wire as the wire is drawn into the slot (16) in the connector to establish electrical contact between the wire and the connector, one cutting edge (26, 27) being provided by an edge of the slot (21, 22) in one of the two overlying parts (18, 19; 18, 20) and the other cutting edge (26, 27) being provided by an edge of the slot (21, 22) in the other of the two overlying parts (18, 19; 18, 20).

6. A connector having at least two spaced parallel arms (17) each having the structure of a connector as claimed in any one of the preceding claims.

7. A commutator segment for an armature of an electric motor, comprising a brush-contacting portion (9) and a connector (12) as claimed in any one of the preceding claims, integral with the brush-contacting portion (9).

8. A commutator for an armature of an electric motor, comprising a commutator base (10), a plurality of commutator segments (11) each as claimed in claim 7, and means (14) securing the segments (11) on the base (10).

9. An electric motor equipped with a commutator as claimed in claims 8.

Patentansprüche

1. Elektrischer Verbinder mit zwei übereinanderliegenden Teilen (18 und 19; 18 und 20), wobei jedes Teil (18 und 19; 18 und 20) mit einem Schlitz (21, 22) versehen ist, der an einem Ende offen ist, und die beiden Schlitz (21, 22) so angeordnet sind, daß sie sich nur teilweise überlagern, gekennzeichnet dadurch, daß der resultierende Schlitz (16) in dem Verbinder enger als jeder der Schlitz (21, 22) in den beiden übereinanderliegenden Teilen (18 und 19; 18 und 20) ist, um an dem offenen Ende einen Draht aufzunehmen und zu greifen, und daß an die Schlitz (21, 22) angrenzende, nichtausgerichtete Abschnitte (31, 32) der beiden übereinanderliegenden Teile (18, 19; 18, 20) in einer Richtung senkrecht zur Ebene

jedes der übereinanderliegenden Teile (18, 19, 20) gegenüber der Ebene des entsprechenden Teils (18, 19, 20) zum anderen Teil (18, 19, 20) hin versetzt sind.

2. Verbinder nach Anspruch 1, gekennzeichnet dadurch, daß diese nichtausgerichteten Abschnitte (31, 32) zur Hälfte aus der Ebene des entsprechenden Teils (18, 19, 20) abgesichert sind und die beiden übereinanderliegenden Teile (18, 19; 18, 20) miteinander in Kontakt oder eng beieinander sind, so daß diese Abschnitte (31, 32) in, oder im wesentlichen in, einer gemeinsamen Ebene liegen.

3. Verbinder nach einem der vorstehenden Ansprüche, gekennzeichnet dadurch, daß die beiden übereinanderliegenden Teile (18, 19; 18, 20) integral mit einer Falzlinie (23, 24) verbunden sind, die quer zur Längsausdehnung des resultierenden Schlitzes (16) verläuft.

4. Verbinder nach einem der vorstehenden Ansprüche, gekennzeichnet dadurch, daß er einen Widerhaken (28, 29) zum Festhalten des Verbinders in einem Gehäuse (14) einschließt.

5. Verbinder nach einem der vorstehenden Ansprüche, gekennzeichnet dadurch, daß der resultierende Schlitz (16) im Klemmenabschnitt (12) zwei Schneidkanten (26, 27) zum Durchtrennen der Isolierung eines isolierten Drahtes hat, während der Draht in den Schlitz (16) im Verbinder gezogen wird, um den elektrischen Kontakt zwischen dem Draht und dem Verbinder herzustellen, wobei eine Schneidkante (26, 27) durch eine Kante des Schlitzes (21, 22) in einem der übereinanderliegenden Teile (18, 19; 18, 20) gebildet wird und die andere Schneidkante (26, 27) durch eine Kante des Schlitzes (21, 22) im anderen der beiden übereinanderliegenden Teile (18, 19; 18, 20) gebildet wird.

6. Verbinder mit wenigstens zwei getrennten, parallelen Armen (17), die jeweils den Aufbau eines Verbinders nach einem der vorstehenden Ansprüche haben.

7. Kommutatorlamelle für einen Anker eines Elektromotors, mit einem Bürstenkontaktabschnitt (9) und einem Verbinder (12) nach einem der vorstehenden Ansprüche, welcher mit dem Bürstenkontaktabschnitt (9) ein Ganzes bildet.

8. Kommutator für einen Anker eines Elektromotors, mit einem Kommutatorsockel (10), einer Vielzahl von Kommutatorlamellen (11), jede ge-

mäß Anspruch 7, und einem Mittel (14) zur Sicherung der Lamellen (11) am Sockel (10).

9. Elektromotor, der mit einem Kommutator nach Anspruch 8 ausgestattet ist.

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Revendications

1. Un connecteur électrique possédant deux parties superposées (18 et 19; 18 et 20) chaque partie (18 et 19; 18 et 20) comportant une fente (21, 22) ouverte à une extrémité, les deux fentes (21, 22) étant agencées de sorte à ne concorder que partiellement l'une avec l'autre, caractérisé en ce que la fente résultante (16) dans le connecteur est plus étroite que chacune des fentes (21, 22) dans les deux parties superposées (18 et 19; 18 et 20) pour recevoir et serrer un fil au niveau de l'extrémité ouverte, et en ce que les régions non alignées (31, 32) entourant les fentes (21, 22) des deux parties superposées (18, 19; 18, 20) sont décalées, dans une direction perpendiculaire au plan de chaque partie superposée (18, 19, 20), en-dehors du plan de la partie associée (18, 19, 20) en direction de l'autre partie (18, 19, 20). 10
2. Un connecteur suivant la revendication 1, caractérisé en ce que lesdites régions non alignées (31, 32) sont cisailées à moitié en-dehors du plan de la partie associée (18, 19, 20) et en ce que les parties superposées (18, 19; 18, 20) sont en contact ou étroitement adjacentes l'une à l'autre, de sorte que lesdites régions (31, 32) se situent effectivement ou pratiquement dans un plan commun. 15
3. Un connecteur suivant l'une quelconque des revendications précédentes, caractérisé en ce que les deux parties superposées (18, 19; 18, 20) sont connectées intégralement sur une ligne de pliage (23, 24) s'étendant transversalement par rapport à l'extension longitudinale de ladite fente résultante (16). 20
4. Un connecteur suivant l'une quelconque des revendications précédentes, caractérisé en ce qu'il comprend un picot (28, 29) servant à retenir le connecteur dans un logement (14). 25
5. Un connecteur suivant l'une quelconque des revendications précédentes, caractérisé en ce que la fente résultante (16) dans la partie de borne 12 possède deux arêtes de sectionnement (26, 27), destinées à découper, en la traversant, l'isolation d'un fil isolé lorsqu'on le tire dans la fente (16) dans le connecteur, pour 30

établir un contact électrique entre le fil et le connecteur, une arête de sectionnement (26, 27) étant constituée par une arête de la fente (21, 22) dans l'une des deux parties superposées (18, 19; 18, 20) et l'autre arête de sectionnement (26, 27) étant constituée par une arête de la fente (21, 22) dans l'autre des deux parties superposées (18, 19; 18, 20).

6. Un connecteur possédant au moins deux branches parallèles espacées (17), ayant chacune la structure d'un connecteur suivant l'une quelconque des revendications précédentes. 35
7. Une lame de collecteur pour un induit d'un moteur électrique, possédant une partie de contact à balais (9) et un connecteur (12) suivant l'une quelconque des revendications précédentes, faisant partie intégrante de la partie de contact à balais (9). 40
8. Un collecteur pour un induit d'un moteur électrique possédant une base de collecteur (10), plusieurs lames de collecteur (11), chacune suivant la revendication 7, ainsi qu'un moyen (14) fixant les lames (11) sur la base (10). 45
9. Un moteur électrique équipé d'un collecteur suivant la revendication 8. 50

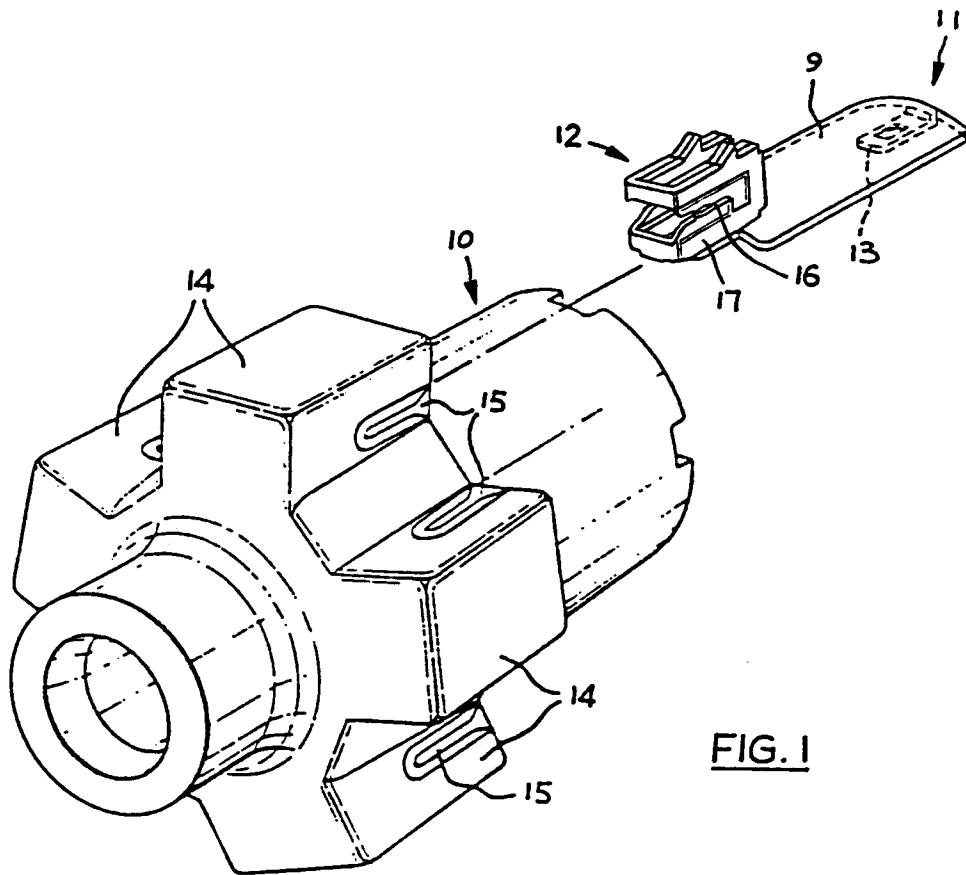


FIG. 1

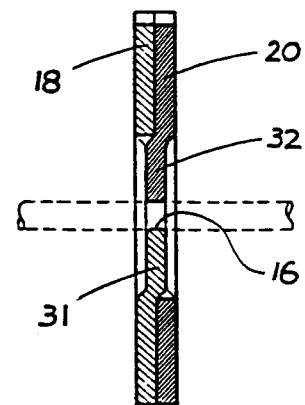


FIG. 4

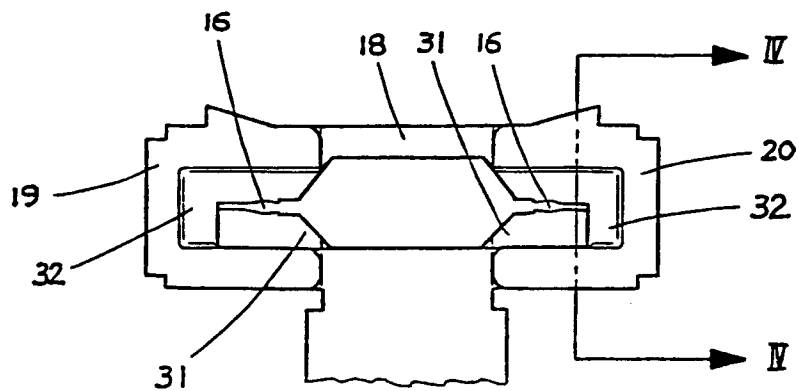


FIG. 3

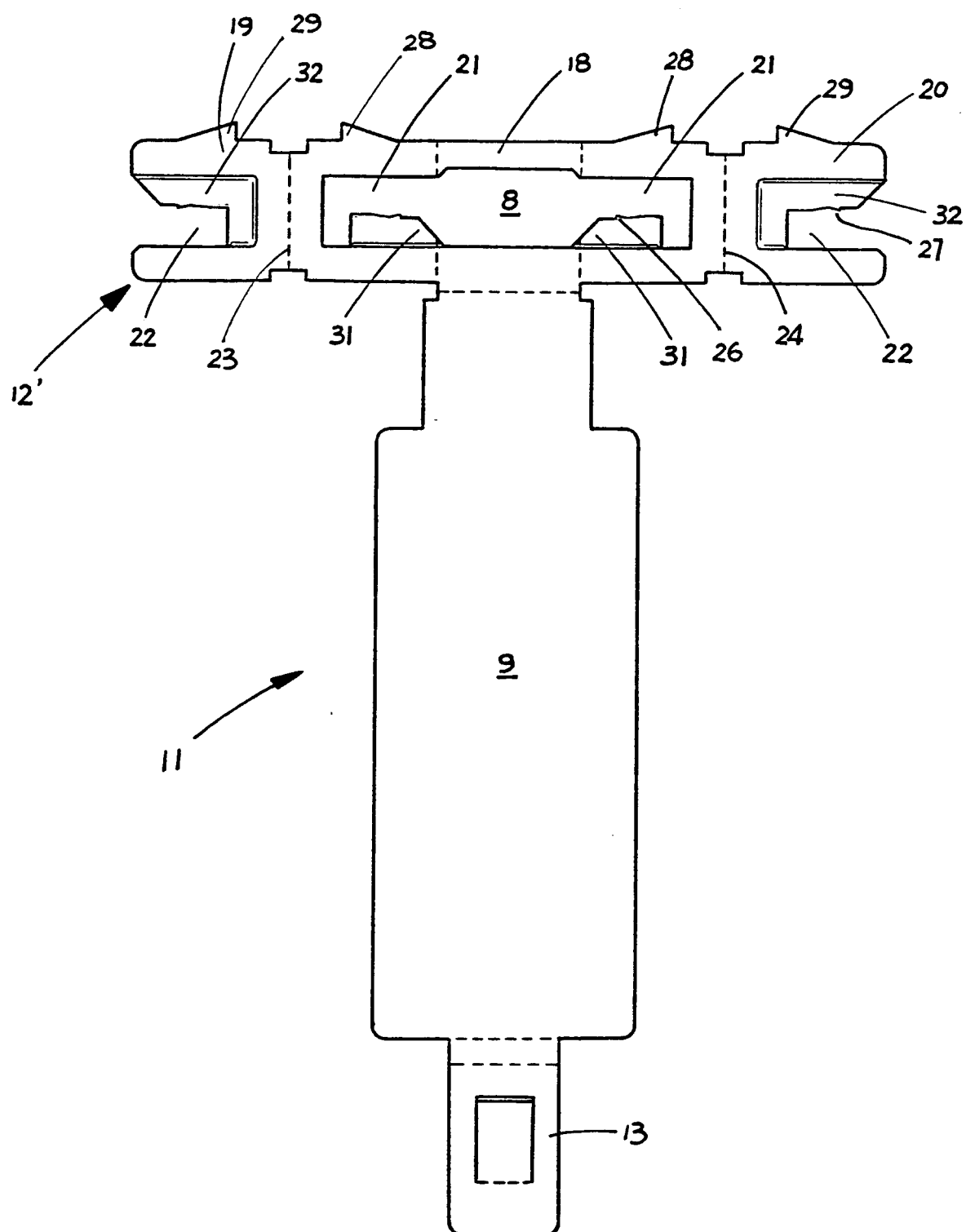


FIG. 2